

Amendments to the Drawings:

Submitted herewith are replacement sheets for FIGS. 8 and 10.

REMARKS

In the Office Action dated March 25, 2005, the Examiner objected to the drawings as containing informalities. The Examiner further objected to claims 9 and 23 as allegedly containing various informalities. The Examiner additionally rejected claims 1-4 under U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,205,150 (hereinafter "RUSZCZYK"); claims 11-16, 18 and 20-22 under U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,523,098 (hereinafter "ANDERSON"); claims 5 and 10 under 35 U.S.C. §103(a) as allegedly being unpatentable over RUSZCZYK in view of ANDERSON; claim 8 under 35 U.S.C. §103(a) as allegedly being unpatentable over RUSZCZYK in view of U.S. Patent No. 5,892,766 (hereinafter "WICKI"); claim 9 under 35 U.S.C. §103(a) as allegedly being unpatentable over RUSZCZYK in view of WICKI and U.S. Patent Application Publication No. US 2001/0021174 (hereinafter "LUIJTEN"); claim 17 under 35 U.S.C. §103(a) as allegedly being unpatentable over ANDERSON in view of LUIJTEN; claim 19 under 35 U.S.C. §103(a) as allegedly being unpatentable over ANDERSON in view of U.S. Patent Application Publication No. 2003/0021230 (hereinafter "KUO"); and claim 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over ANDERSON in view of LUIJTEN. Applicants note with appreciation the Examiner's indication of allowable subject matter in claims 6 and 7.

Applicants hereby amend claims 9, 11 and 21 to improve form. Claims 12, 13, 16 and 17 have been canceled without prejudice or disclaimer. Reconsideration of the outstanding rejections of pending claims 1-5, 8-11, 14, 15 and 18-23 is respectfully requested in view of the amendments above and the following remarks.

In paragraph 1, the Office Action objects to the drawings. Specifically, the Office Action objects to the misspelling of the word “priority” in blocks 1020 and 1070 of FIG. 10. Included herewith is a replacement drawing sheet for FIG. 10 in which the misspelled word “priority” has been corrected in blocks 1020, 1050 and 1070. Also included herewith is a replacement drawing sheet for FIG. 8 in which a space is inserted between the words “memory” and “and” in block 840. In view of the correction of the informalities in FIGS. 8 and 10, Applicants request that the object to the drawings be withdrawn.

In paragraph 2, the Office Action objects to claims 9 and 23 as allegedly containing informalities. With regards to claim 9, the Office Action suggests that the phrase “the duration” in line 1 should be replaced with the phrase “a duration.” In accordance with the suggestion of the Examiner, Applicants have amended claim 9 to delete the word “the” before the word “duration” and replace it with the word “a.” In view of this amendment, Applicants request that the objection to claim 9 be withdrawn. With regards to claim 23, the Office Action has suggested that the phrase “the duration” in line 2, after “setting,” should be replaced with the phrase “a duration.” Applicants, however, respectfully disagree with this suggestion. Independent claim 21, from which claim 23 depends, recites the feature “excluding a queue that contained the selected low priority notification from subsequent arbitration for *a duration* when the data unit size exceeds the threshold” (emphasis added). Therefore, the phrase “setting the duration....” in dependent claim 23 has sufficient antecedent basis in claim 21. Applicants, thus, believe that no change to claim 23 is required, and respectfully request withdrawal of the objection to claim 23.

In paragraph 4, the Office Action rejects claims 1-4 under 35 U.S.C. §102(e) as allegedly being anticipated by RUSCZYK. Applicants respectfully traverse.

Independent claim 1, for example, recites a “system for managing flow of data in a network device.” The system includes “a plurality of high priority queues configured to store data unit information.” The system further includes “a plurality of low priority queues configured to store data unit information” and “an arbiter configured to selectively bypass a low priority queue based on a size of a data unit in the low priority queue.”

A proper rejection under 35 U.S.C. §102 requires that a reference teach every aspect of the claimed invention. See M.P.E.P. §2131. RUSCZYK does not disclose or suggest each and every feature recited in Applicants' claim 1. For example, RUSCZYK does not disclose or suggest “an arbiter configured to selectively bypass a low priority queue based on a size of a data unit in the low priority queue,” as recited in claim 1. The Office Action relies on column 5, lines 40-47; column 6, lines 13-16 and block 68 of FIG. 4 of RUSCZYK for allegedly disclosing the feature set forth above. Applicants respectfully submit that these sections of RUSCZYK do not disclose or suggest “an arbiter configured to selectively bypass a low priority queue based on a size of a data unit in the low priority queue,” as recited in claim 1.

At column 5, lines 40-47, RUSCZYK discloses:

At step 52, the router schedules the lower priority data packets in the low priority queue using a weighted round robin scheduling method which assigns a transmission deadline to the data packet. As is known in the art, a weighted round robin scheduling method prescribes an order for which data packets in a queue will be executed by assigning a "weight" to each data packet in the queue. The scheduler determines the weight of a data packet by using the transmission deadline and size of the data packet, and the apparent backlog of other data packets in the queue.

This section of RUSZCZYK, thus, discloses a weighted round robin scheduling method by which data packets in a single queue are scheduled for transmission from the queue in an order that is based on a weight that is assigned to each of the data packets, where the assigned weight is further based on a size associated with each of the packets. This section of RUSZCZYK, therefore, discloses the ordering of the transmission of packets from a single queue based, at least in part, on a size of each of the packets. This section of RUSZCZYK does not disclose, or even suggest, an arbiter that bypasses a low priority queue of a plurality of low priority queues based on a size of a data unit in the low priority queue, as recited in claim 1.

At column 6, lines 13-16, RUSZCZYK discloses:

Sorter 60 also determines whether a data packet in combination queue 58 is a lower priority data packet with a transmission deadline and if so, inserts the lower priority data packet into a low priority queue 66. Router 20 then schedules the lower priority data packet in low priority queue 66 using a weighted round robin scheduling method scheduler 68. Once a transmission deadline of a lower priority data packet in low priority queue 66 has expired, a promoter 70 promotes the lower priority data packet to high priority queue 62 whereby the promoted data packet is scheduled by guaranteed scheduling method 64.

This section of RUSZCZYK discloses an exception to the weighted round robin scheduling method described above, by which a low priority data packet is promoted from a low priority queue to a high priority queue and is scheduled for transmission based on the expiration of a transmission deadline using a guaranteed scheduling method, instead of using the weighted round robin scheduling method that applies to packets in the low priority queue. This section of RUSZCZYK, thus, discloses the transmission of a low priority data packet using a

guaranteed scheduling method, based on the expiration deadline associated with the packet, and not based on a size of the packet. This section of RUSCZYK does not disclose, or even suggest, an arbiter that bypasses a low priority queue of a plurality of low priority queues based on a size of a data unit in the low priority queue, as recited in claim 1. Since RUSCZYK does not disclose or suggest each and every feature of claim 1, RUSCZYK cannot anticipate claim 1. Withdrawal of the rejection of claim 1 is, therefore, respectfully requested.

Claims 2-4 depend from claim 1 and, therefore, patentably distinguish over RUSCZYK for at least the reasons set forth above with respect to claim 1. These claims include additional features not disclosed or suggested by RUSCZYK. For example, claim 2 recites “a high priority arbiter configured to perform arbitration on a plurality of high priority queues” and “a low priority arbiter configured to perform arbitration on a plurality of low priority queues when enabled.” The Office Action asserts that these features are disclosed in column 6, lines 1-5; FIG. 4, block 64; and column 6, lines 13-16 of RUSCZYK.

At column 6, lines 1-5, RUSCZYK discloses:

Router 20 then schedules the data packets in high priority queue 62 using a guaranteed scheduling method 64 scheduler and sends the high priority data packets to a transmitter 72 for execution in the order determined by guaranteed scheduler 64.

This section of RUSCZYK merely discloses using a guaranteed scheduling method for transmitting packets from a single high priority queue 62. As further discussed above with respect to claim 1, column 6, lines 13-16 of RUSCZYK merely discloses the transmission of a low priority data packet using the guaranteed scheduling method 64, based on the expiration

deadline associated with the packet, and not based on a size of the packet. Block 64 of FIG. 4 further depicts weighted round robin scheduler 68 that, as discussed above with respect to claim 1, executes a weighted round robin scheduling method by which data packets in a single low priority queue are scheduled for transmission from the queue in an order that is based in part on a weight that is assigned to each of the data packets, where the assigned weight is further based on a size associated with each of the packets. Thus, as described in the above cited sections of RUSZCZYK, and depicted in FIG. 4, RUSZCZYK discloses the use of a guaranteed scheduler 64 for scheduling the transmission of high priority packets stored in a *single high priority queue* 62, and the use of a weighted round robin schedule for scheduling the transmission of low priority packets stored in a *single low priority queue* 66. RUSZCZYK, thus, discloses a first scheduler 64 for scheduling packets from a single high priority queue and a second scheduler 68 for scheduling packets from a single low priority queue. Neither the above cited sections of RUSZCZYK, or any other section of RUSZCZYK, discloses the performance of arbitration on a *plurality* of high priority queues or the performance of arbitration on a *plurality* of low priority queues, as recited in dependent claim 2. Withdrawal of the rejection of claim 2 is requested for at least this additional reason.

In paragraph 5, the Office Action rejects pending claims 11, 14, 15, 18 and 20-22 under 35 U.S.C. §102(e) as allegedly being anticipated by ANDERSON. Applicants respectfully traverse.

Amended independent claim 11 recites “selecting high priority data units from at least one of a plurality of high priority queues,” “selecting a low priority data unit from a low priority queue of a plurality of low priority queues if no high priority data units can be

selected,” “comparing a size of the selected low priority data unit with a threshold” and “removing the low priority queue from arbitration for a programmable duration when the low priority data unit size exceeds the threshold.” Applicants submit that ANDERSON does not suggest or disclose each and every feature of claim 11. For example, ANDERSON does not disclose or suggest “comparing a size of the selected low priority data unit with a threshold” and “removing the low priority queue from arbitration for a programmable duration when the low priority data unit size exceeds the threshold,” as recited in amended claim 11. The Examiner relied on column 4, lines 31-40 and column 5, lines 35-56 of ANDERSON for allegedly disclosing the various features of claim 11.

At column 4, lines 31-40, ANDERSON discloses:

However, when arbiter 100 receives a request for an opportunistic operation, such as a low priority flush request, arbiter 100 does not place the request in request queue 300, or in other words, does not generate enabling signal 114 to service the request, until certain conditions are met. In one embodiment of arbiter 100, arbiter 100 generates enabling signal 114 when two conditions are met. First, pending high-priority-operation detector 104 indicates in status signal 110 that no pending requests for high priority operations exists. Second, resource busy detector 106 indicates in status signal 108 that resources are not committed.

This section of ANDERSON merely discloses that arbiter 100 does not service a low priority “flush request” unless there are no pending requests for high priority operations, as indicated by high-priority-operation detector 105, and unless resource busy detector 106 indicates that resources are not committed. This section of ANDERSON, therefore, discloses the non-servicing of a low priority flush request based on the commitment of resources, and does not disclose, or even suggest, the comparison of a size of a selected low priority data unit with a

threshold and removing a low priority queue from arbitration for a programmable duration when the low priority data unit size exceeds the threshold, as recited in claim 11.

At column 5, lines 35-56, ANDERSON discloses:

FIG. 5 illustrates a flow chart of one embodiment of a process performed by one embodiment of arbiter 100 to service a low-priority flush request. Arbiter 100 begins by verifying whether there exists one or more pending requests of any priority type in block 500. If the condition in block 500 returns false, arbiter 100 waits in block 502. Otherwise, arbiter 100 proceeds to determine whether there exists one or more high-priority requests in block 504. If the condition in block 504 returns true, in conjunction with FIG. 3, arbiter 100 selects and issues a high-priority request to request queue 300 in block 506. Otherwise, arbiter 100 proceeds to establish whether the pending requests are low-priority flush requests in block 508. If there exists a low-priority flush request, arbiter 100 proceeds to *determine the availability of the resources according to any of the previously described mechanisms in block 510*. When no low-priority flush request exists, arbiter 100 returns to block 502 and continues to wait for other incoming requests. Lastly, when block 510 indicates that resources are available, arbiter 100 services the low-priority flush request in block 512. In other words, arbiter 100 issues enabling signal 114 and places the low-priority flush request in request queue 300 (emphasis added).

This section of ANDERSON discloses the determination of the availability of resources (block 510) in response to a low priority flush request (block 508). In determining the availability resources, the emphasized portion of the above section cites to resource availability determination mechanisms described in another portion of ANDERSON not cited by the Office Action. Such mechanisms are described in column 4, lines 42-57 of ANDERSON:

More specifically, one implementation of resource busy detector 106 may base its determination of resource availability based on the number of memory commands pending in command queue 304 or the number of memory access requests pending in request queue 300. Alternatively, either resource busy detector 106 or scheduler 302 may have a table with predetermined timing information associated with each memory command. Either 106 or 302 then

calculates the amount of time memory subsystem 216 is committed to based on the memory commands and their corresponding timing information. In the case of scheduler 302, scheduler 302 communicates the calculated information to resource busy detector 106 through signal 314. In short, resource busy detector 106 generates status signal 108 based on the downstream information received from signal 310, signal 312 and signal 314.

This section of ANDERSON discloses that resource availability is determined based on a number of memory commands pending in a command queue 304 or a number of memory access requests pending in request queue 300, and has nothing to do with the comparison of a data unit size with a threshold. This resource availability determination process cited by the Office Action, therefore, does not disclose, or even suggest, the removal of a low priority queue from arbitration when a low priority data unit size exceeds a threshold, as recited in claim 11. ANDERSON, thus, does not anticipate the invention of claim 11 and, therefore, withdrawal of the rejection of this claim is respectfully requested.

Claims 14 and 15 depend from claim 11 and, therefore, patentably distinguish over ANDERSON for at least the reasons set forth above with respect to claim 11.

Independent claim 18 recites the feature “circuitry configured to compare a data unit size associated with the selected notification with a threshold, and to remove the low priority queue that contained the selected notification from further arbitration for a programmable duration when the data unit size exceeds the threshold,” that is similar to the features discussed above with respect to claim 11. Applicants, therefore, respectfully submit that claim 18 patentably distinguishes over ANDERSON for similar reasons to those set forth above with respect to claim 11.

Claim 20 depends from claim 18 and, therefore, patentably distinguishes over ANDERSON for at least the reasons set forth above with respect to claim 18.

Independent claim 21 recites the features “comparing a data unit size associated with the selected low priority notification with a threshold” and “excluding a queue that contained the selected low priority notification from subsequent arbitration when the data unit size exceeds the threshold,” that are similar to the features discussed above with respect to claim 11. Applicants, therefore, respectfully submit that claim 21 patentably distinguishes over ANDERSON for similar reasons to those set forth above with respect to claim 11.

Claim 22 depends from claim 21 and, therefore, patentably distinguishes over ANDERSON for at least the reasons set forth above with respect to claim 21.

In paragraph 7, the Office Action rejects claims 5 and 10 under 35 U.S.C. §103(a) as allegedly being unpatentable over RUSZCZYK in view of ANDERSON. The Office Action cites ANDERSON for disclosing a resource availability method for servicing a low priority request. However, the disclosure of ANDERSON does not remedy the deficiencies in the disclosure of RUSZCZYK noted above with respect to claim 1, from which claims 5 and 10 depend. Furthermore, as discussed above with respect to claim 11, resources are determined to be available in ANDERSON based on a number of memory commands pending in a command queue 304 or a number of memory access requests pending in request queue 300, and not based on any comparison of a size of data unit with one or more thresholds. ANDERSON, thus, does not disclose or suggest “a comparison element configured to compare a size of a data unit with one or more thresholds and to output one or more control

signals based on the comparison," as recited in claim 5. Withdrawal of the rejection of claims 5 and 10 is, therefore, respectfully requested for at least the above reasons.

In paragraph 8, the Office Action rejects claim 8 under 35 U.S.C. §103(a) as allegedly being unpatentable over RUSZCZYK in view of WICKI. The Office Action cites WICKI as allegedly disclosing a flow control receiver unit in an arbiter that receives buffer status messages indicating the space capacity of an input buffer. The disclosure of WICKI, however, does not remedy the deficiencies in the disclosure of RUSZCZYK noted above with respect to claim 1, from which claim 8 depends. Applicants, therefore, request withdrawal of the rejection of claim 8 for at least the reasons set forth above with respect to claim 1.

In paragraph 9, the Office Action rejects claim 9 under 35 U.S.C. §103(a) as allegedly being unpatentable over RUSZCZYK in view of WICKI and further in view of LUIJTEN. The Office Action cites LUIJTEN for allegedly disclosing a process of defining flow control latency. The disclosure of LUIJTEN, however, does not remedy the deficiencies in the disclosure of RUSZCZYK and WICKI noted above with respect to claim 8, from which claim 9 depends. Applicants, therefore, request withdrawal of the rejection of claim 9 for at least the reasons set forth above with respect to claim 8.

In paragraph 19, the Office Action rejects claim 19 under 35 U.S.C. §103(a) as allegedly being unpatentable over ANDERSON in view of KUO. The Office Action cites KUO for allegedly disclosing a flow control device that detects congestion and notifies a scheduler accordingly. The disclosure of KUO, however, does not remedy the deficiencies in the disclosure of ANDERSON noted above with respect to claim 18, from which claim 19

depends. Applicants, therefore, request withdrawal of the rejection of claim 19 for at least the reasons set forth above with respect to claim 18.

In paragraph 23, the Office Action rejects claim 23 under 35 U.S.C. §103(a) as allegedly being unpatentable over ANDERSON in view of LUIJTEN. The Office Action cites LUIJTEN for allegedly disclosing a process of defining flow control latency. The disclosure of LUIJTEN, however, does not remedy the deficiencies in the disclosure of ANDERSON noted above with respect to 21, from which claim 23 depends. Applicants, therefore, request withdrawal of the rejection of claim 23 for at least the reasons set forth above with respect to claim 21.

In view of the foregoing amendments and remarks, Applicants respectfully request the Examiner's reconsideration of this application, and the timely allowance of the pending claims. If any questions remain, the Examiner is invited to contact the undersigned at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1070 and please credit any excess fees to such deposit account.

Respectfully submitted,



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